

DIGITIZATION AND ITS IMPACT ON ECONOMY

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Abstract

The waves of adoption and usage of ICTs (Information and Communication Technologies) have revolutionized our world by introducing distinct technology-enabled services in every sphere of our lives. There are various applications of ICT, digitization is one of them. Digitization is a process of converting the diverse forms of information, such as text, sound, image or voice into digitalized format. The digitization has a proven impact on economy and society by reducing unemployment, improving quality of life, and boosting access to knowledge and other public services. The process of digitization is marked by cost effectiveness to cut the cost that incurred in various knowledge practices related to the production, organization and communication of information that makes long-term economic growth. The process of digitization facilitates to preserve, access, and share an original document to the people worldwide that may only be available earlier to those who visit its physical location. A number of measures are taking in the field all over the world and in India, to conserve and preserve the knowledge of the past and present for the upcoming generations. This paper highlights the concept of digitization along with the social economic and ecological benefits of digitization of knowledge and information.

Keyword: Digitization, Economical impact, Ecological benefits, societal impact, cultural heritage, preservation, open access,

1. INTRODUCTION

Right information to the right user at the right time has been the aim of information professionals. Recent developments in the information and communication technologies, especially the Internet and the Web based technologies have brought significant changes in the ways the information generate, distribute, access and use. These technologies play an important role to minimize the problems in using information at its earliest.

For a long time, we have been using printed information sources which are made available to us by the efficient efforts of publishers, booksellers, librarians and information scientists. But, with the introduction of information technology so many steps have been taken to reduce the efforts in accessing the information in a short span of time. One of the significant application of IT is the digitization of knowledge i.e., to convert the printed information in the digital form and made available for use with the help of computer networks. This has changed the whole scenario of information world.

2. DIGITIZATION

In, today's digital society, all knowledge is divided into two binary strings, 0s and 1s that codified the data, which allow people to create, control, and share data in ways that to be revolutionary.

According to **Pearce-Moses (2005)** "Digitization is the process of transforming analog material into binary electronic (digital) form, especially for storage and use in a computer". Digitization converts materials from analog formats that can be read by people to a digital format that can be read only by machines. The devices like scanner, cameras, and a number of other devices can be used to digitize knowledge contents. These technologies allow the digitization of almost all types of materials, including paper documents, rare documents, photographs, sound recordings, and motion pictures.

Information is created in various formats at an accelerating rate through various media and it is become increasingly complicated to remain abreast in this overflow of literature without the help of information technology. Digitization improves access to information resources. Digital projects allow users to search for collections rapidly and comprehensively from anywhere at any time. The process of digitization makes the invisible to be visible. A number of users can access the same document at the same time without hindrance. It also removes the trouble of distance, as users do not have to travel to locations that possess the hard copies of materials.

Although, digitization is a time consuming and very expensive venture, but, it is a powerful way to cope up with the problems of persistent shortage of periodicals and other technical literature in institutions, universities and technological schools in the developing world. Numerous organizations and institutions are taking initiatives in digitizing their documents, archives of newspapers, artifacts, theses and dissertations and other historical documents and

images. This helps scientists, administrators, students, and other information seekers to have, wide access to innovations possible at a right time which are earlier outside their domain. Digitization defines by many scholars in a variety of ways. Some of them are as follows:

Witten and David (2003) define Digitization as, “the process of taking traditional library materials that are in form of books and papers and converting them to the electronic form where they can be stored and manipulated by a computer”.

The US Institute of Museum and Library Services (IMLS) defines digitization as “the process of converting, creating, and maintaining books, art works, historical documents, photos, journal, etc. in electronic representation so they can be viewed via computers and other devices”.

3. NEED FOR DIGITIZATION

The basic idea of digitization is to make full use of ICT facilities for accessing worldwide resources and beneficial for society at the same time. As going digital is the need of the hour, to remain environment healthy and safe. Various organizations are involved in digitizing their material because they remain influenced of the enduring value of such resources for learning. Digitization also raises the reputation of the institutions as global users can know the institutional collection and utilize these resources from distant locations.

The main reasons to digitize are to enhance access and improve preservation. By digitizing their collection, institutions can make information accessible that was previously only available to a select group of users. Digitization can also help preserve materials making high-quality digital images available electronically and may reduce wear and tear on brittle and fragile documents.

3. BENEFITS OF DIGITIZATION

Developing a digital substitute of rare, brittle or fragile original documents can provide access to users while preventing the original from damage by handling or display. This is the motivation behind the digitization of many artifacts. Following are the certain benefits of digitization.

- The documents can be viewed from anywhere, at any time of the day
- The documents can be printed directly from the web
- Users can find what they are looking for promptly and independently
- It can save staff reference time by answering frequently asked questions on the web
- It can enhance images electronically so that they can be viewed with greater legibility
- It increases use of collections and facilitates learning and scholarship
- The documents do not have to be re-shelved or located by staff
- The documents are not handled frequently which lessen wear and tear

Apart from the general benefits that are discussed above, there are certain specific benefits of digitization that may help in making the society economically and ecologically sustained.

4.1. ECONOMIC IMPACTS OF DIGITIZATION

The consequences of the developments in the technicalities of Information and Communication Technology introduce the concept of digitization. The transformation from print to digital media for communication of information to the larger community is resulted from the growth of the Internet and now enables the tremendous amount of information accessible to everyone. By the process of digitization, knowledge to an ever greater amount is being produced, processed, communicated and preserved digitally. The economics related to the concept of digitization is two-fold. The first one, how economic is the process of digitization? and second, its impact on the economy of the countries.

4.1.1. DIGITIZATION: HOW MUCH ECONOMIC IT IS?

The economy related to the process of digitization is mainly realized through the ways that involves in creation, preservation, dissemination and use of digital information. Digitization of information seems to be quite valuable and economical for the present society. However, the process of digitization at its preliminary stages is not considered economical, but its inexpensive impact can be realized in later stages, in terms of increasing returns, zero marginal cost and long-term usage of digitized content by the larger community. Digitization, despite being expensive at the initiative level such as designing a website, scanning of documents, well-edited text and navigational aids, fast hardware, software packages and good connections/ bandwidths, continual migration to new technology, etc., it saves much of the production costs and reasonable in comparison to the conventional form of distributing system of information. The cost that saves in the digitizing technology is other way round and it reduces the marginal cost of production of documents. The cost lie in the staff digitizing the work, the computer system and the effective flow of information over the internet is mainly fixed cost or first copy cost. The marginal cost of issuing many copies of one document is quite less. Digitization provides long-term benefits for the society, although it may take many years to realize these benefits fully. Thus, the economy of digitization involves short-term investments and in return get long run benefits.

In today's society, electronic sources are the example of the new and changing models of delivery of information. The access to the digitalized information through electronic sources, such as e- journals, consortium, online databases and other like resources save much cost than that spent in subscribing print sources. The cost of purchasing the information online, in spite of buying it in print form is saving much of the expenditure. As the cost related to buying the print sources include storing, shelving, as well as the costs related to the physical storage of the content, which are the direct cost to the organizations. The shift to purchasing electronic content has reduced the cost of maintaining the physical materials, although has somewhat increase in cost of preserving the content. The cost of networking technology has been decreased over the years as well, and makes access and dissemination of digital

information more cost-effective and economical to the creators, distributors and information seekers. In addition to this, widespread inexpensive access to digital information has benefitted the large mass of users. There are some institutions that may realize savings from other forms of publication or distribution i.e. by developing digitized collection as online access becomes the preferred delivery method for knowledge contents. Developing a critical mass of digital content as electronic reserve, or short-loan collections may enable savings in the institutions (libraries, etc.) by reducing the library hours, or staff time, needed to manage such labor-intensive task. Besides, such practices can also replace the postal cost of print information contents with web based documents and this sort of savings is considered as indirect benefits of digitization. Therefore, it is not only brought financial benefits, but also, some value added benefits such as user satisfaction and advancement in learning and research. With no definitive evidence base to give concrete numbers about the economic value of digitization to an institution, Many factors will come into play when evaluating the 'value' of digital resources, but these factors may help in assessing when digitizing collections can be cost effective or not. Valuable digital resources, which will bring prestige to the institutions that are creating and maintaining them, and support scholarship without any loss of the benefits of working with the originals.

In the same context of reducing the cost, open access publishing is one of the impacts of digitizing technology. The open access model is based on the long term preservation and dissemination of documents at least cost that is quite high in the conventional and closed medium of production. Open access is the free availability of scholarly material over the web, one can freely read, download, reuse, and redistribute the documents in the open access environment for non-commercial purposes only. Open access resources include Institutional repositories, online databases and many e-journals, etc., and these are quite advantageous in terms of production and access of scholarly material over payment-based systems. As restricting access to information is costlier and required much labour and cost in implementing security systems, billing procedures, maintaining databases of authorized users and responding to queries that add complexity to the simple process of mounting information on a computer and providing access via the WWW. However, it is true that open access information on the web is not free to produce, but it is considerably cheaper than conventional publishing and nearly all cost is fixed cost. Digitization will be sustained far away, if it brings long-term revenue for the creators and producers of digital knowledge contents. Hence, the potential of digitization is laid in replacing and improving the existing services and get the maximum by serving the largest with the same number of available resources, i.e. staff and budget.

4.1.2. IMPACT ON ECONOMY

In any geography, the factors related to adoption and usage of digital technology, such as pricing, reliability, speed, and ease of use determine the level of digitization, which in turn has a proven impact on reducing unemployment, improving quality of life, and boosting citizens, access to public services. Digitization allows governments to operate with greater

transparency and efficiency, and it has a dramatic effect on economic growth, but not all at once.

In the current sluggish worldwide economy, the use of digital technologies is served as a means of boosting economic activities. The mass adoption of digital technologies through connected services and devices has proven to accelerate economic growth and facilitate job creation, however, its impact is not uniform in each country. “Developed economies enjoy higher economic growth benefits from digitization, such as growth and productivity, but, as compare with emerging economies have less gain in terms of jobs. The main reason for the differing effects of digitization is the economic structures of developed and emerging economies” (El-Darwiche & Singh, 2013).

The report, published by Booz & Company, discussed the effects of digitization on economies around the world. The Booz & company, a management consulting firm to measure the impact of digitization on cross-country economic progress initiated a study by developing a digitization index, a measure of country level of digitization. For this purpose, the Digitization Index is tested to measure the effect of digital techniques on economic growth, unemployment rate and on societal benefits. This study included 150 nations along with India for the period of six years from 2006 to 2010. In this survey, Countries were divided in four categories such as digitally Constrained, Emerging, Transitional or Advanced, on the basis of digitization activities and contribution of digitization to economic growth, job creation and welfare of the society. These divisions are discussed below (El-Darwiche, Singh & Koster, 2012).

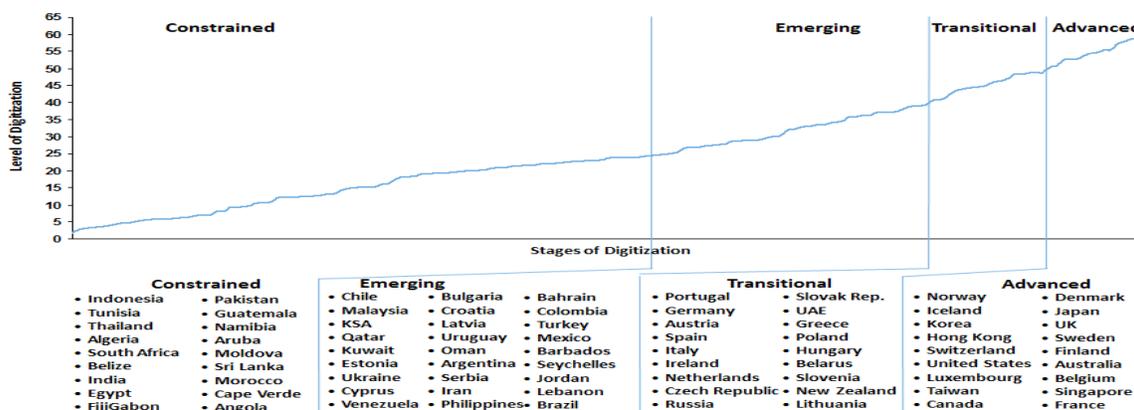
i) Constrained economies (those with a digitization score below 25) have barely begun to develop affordable Internet connections. Internet services remain expensive and limited in reach.

ii) Emerging economies (those with a score between 25 and 29.9) have achieved significant progress in providing affordable and widespread access.

iii) Transitional economies (those with a digitization score between 30 and 39.9) provide citizens with ubiquitous, affordable, and reasonably reliable services, and usage is expanding at a relatively rapid pace.

iv) Advanced economies (those with a score of 40 and higher) are in the most mature stage of digitization. These countries have a talent base that can take advantage of digital services.

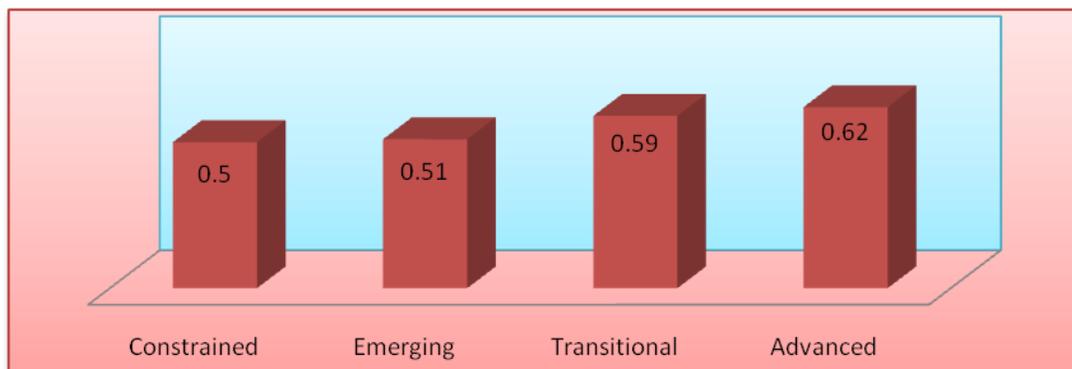
The calculation of the Digitization Index for 150 countries in 2010 reveals that countries tend to follow four clearly development stages.



Source: Maximizing the impact of digitization, Booz and company analysis
 Figure 1: Four clusters of Digitization

The figure-1 shows the cluster of countries, which categorizes under Constrained- the very low, Emerging-the low, Transitional- the medium, and the Advanced.

As the Digitization process reflects a shift in the socio-economic status and this systematic transition is examined for its effects on economic growth, job creation and welfare. The effect of digitization on a country’s economy is highly visible. According to the report, in 150 countries, an increase in digitization of 10 percentage points triggered a 0.50 to 0.62 percent gain in per capita GDP. (See figure-1) By contrast, access (as measured in studies of broadband penetration) contributes a gain in per capita GDP of just 0.16 percent — approximately half as much impact. The more advanced the country, the greater the impact of digitization appears to be, which establishes a virtuous feedback cycle: A country reinforces and accelerates its own progress as it moves along the line. On the basis of data from 2009 and 2010, we estimate that the total global economic impact of digitization, in terms of added GDP, was US\$395 billion per year. (It has, if anything increased since then.).



Source: Global Insight, Booz and company analysis

Figure2: Digitization and economic growth

Within a few years, digitization has shaped a large part of the economy and touched a wide breadth of economic activities. It has changed societal connections, developed new industries and diluted others, and redesigned the people's capabilities to access and disseminate knowledge.

4.1.3. IMPACT ON EMPLOYMENT

The introduction and advancement in Information and Communication Technology has a greater impact on employment, as it creates more jobs in the IT sector, which may be related to software development, Outsourcing, hardware manufacturing and other IT related businesses. In addition, the impact of these technologies has been realized on other service sectors, like in trade, industry, financial and health care services. **El-Darwiche, Singh & Ganediwalla, (2012)** presented a Booz & Company's econometric that analyzed a reduction in nation's unemployment rate by 0.84 % due to 10% increase in digital activities. By the advancement in digitization related activities, there an estimated 19 million jobs were added to the global economy from 2009 to 2010. During 2007 to 2008, a more five % increase is seen in estimated 18 million jobs.

In another study of Booz & Company's, it is observed that digitization in 2011, produced a US\$193 billion boost to world economic production and generated 6 million new jobs in 2011. In the same year in the Middle East and North Africa alone, digitization resulted in an extra \$16.5 billion in output and nearly 380,000 new jobs (**El-Darwiche & Singh, 2013**). This global creation of hundreds of millions of jobs in the last few years has brought a great boom in the society that can highly contribute to the economy of the country. Thus, digitization accelerates economic growth and prosperity of the country by facilitating job opportunities to the peoples.

4.2. SOCIAL IMPACTS OF DIGITIZATION

One of the most interesting and important factors related to digitization is the link to overall societal welfare. Digitization, as a social process, enables the institutions to generate, cooperate and create larger for the benefits and progress of the society through digital communications and applications.

The process of digitization involves the mass digitization of books and older and rare materials. For the purpose of preserving the knowledge contents for future generations or making them available to a much wider community than could ever access the physical objects, many of the institutions (libraries and cultural archives) have started digitization initiatives to provide access to the history of societies, countries, cultures and languages. According to Hughes (2003), more than a last three decades, cultural heritage institutions (libraries, archives and museums) have incorporated technology into all aspects of their mission and services. By digitizing their resources, cultural heritage institutions can make

information accessible that was previously only available to a selected group of users. For digitization, a number of libraries, archives, museums and publishers have been scanning their older documents and rare images for many years and catalogued and made them available through the World Wide Web.

However, the process of digitization is not only means of preservation of knowledge contents, but also protecting these delicate and rare originals documents from heavy wear and tear when presenting to a large community. By providing access to digitized item online, institutions enable the users all over the world to view the information at different time sequel or simultaneously. Also, the users no longer need to invest much time and money to visit the physical location for an item. According to Mulrenin and Geser (2001), this conversion of all types of valuable and cultural contents into bits and bytes gives rise to a new dimension of reaching towards the vast audience making availability to valuable cultural resources in ways that were not possible in the past. Thus, users from all over the world are depending on the ease and speed of digital access for unearthing many new and rare resources, of which they never have any knowledge or found in print collections. Moreover, the digitization is facilitated awareness, research and promotion of both past and present culture and knowledge, also has a direct impact on overall happiness and satisfaction of the people that they get from the capacities and capabilities connecting with digital technology.

4.3. ECOLOGICAL IMPACTS OF DIGITIZATION

During the last few decades, healthy living has become the major concern of society. There has been an increased focus on health related matters. This has led to more people exercising, eating right and using things like cars and power strips less and other techniques to benefit the environment. The initiative has resulted in individuals taking a closer look at the environment and examining their part in making the “Earth” more sustainable for years to come.

As this trend spreads, the sentiment is now being felt at organizations and institutions. Some innovative employees have spearheaded campaigns for workers to use less power by shutting down machines at night, paying more attention to reusing coffee and water cups and numerous other things such as going paperless i.e., digitization is also one of the way to protect and save environment. Little-by-little, these factors can help the Earth to become ecologically sustained. The **Idatix (n.d.)** in its White Paper illustrates some data about the adverse effects of using paper. The data as follows:

“The paper industry is the third greatest contributor to global warming emissions. One ream of paper can generate 18.5 pounds of carbon, excluding transportation and shipping at a direct cost of \$4 per ream. With the average worker consuming some 10,000 to 12,000 sheets of paper per year, a department of 20 employees is generating over 8,880 pounds of carbon for paper consumption alone”.

Condon (2013) describes the news given by Whistler about the positive effects of paperless billing on environment as “when companies embrace paperless billing - not even entirely digitizing - numerous environmental benefits can be seen. Invoices between business partners, as well as those sent as bills to clients, can be shared online, eliminating countless reams of paper that would otherwise be used”.

There are many other ecological benefits of digitization:

1. Cutting tie with paper will permit an organization to transition to make their operations more environmental friendly.
2. Saving paper equates to saving trees and using less overall supplies, which could position an organization ahead of its competitors in terms of positive user sentiment.
3. With digital documents and a document solutions program, organization will no longer have to worry about using hours or even days of time looking for lost documents. Instead, everything will be available instantly via a computer search.
4. Digitisation can help organisations to take advantage of new technologies and allow staff to access records in any location it turns help in making ecological sustainable society as the person does not use vehicle to go here and there and it controls pollution.

CONCLUSION

Digital conversion of print sources has improved rapidly in the past few years. Digitization is the social transformation started by the massive adoption of digital technologies to generate, process, share and manage digital information. Digitization is an inclusive technique of preservation and access by which all the institution's assets are transformed into digital and creating high-quality copies in digital format. It provides advanced opportunities for preservation and access to knowledge contents, also it changes the ways in which collections are used and accessed. Emerging digitization initiatives and ways in which institutions are becoming digital are causing various effects on economy, society and academics as well. These radical and rapid changes make the information presentation and distribution more rapid, open, and global access to the information than has been available in the past. In addition, converting material from analog to digital format reduces some of the costs included in digitization operations for providing access to print sources.

However, the digital copies should not be a replacement for the original items of knowledge. Digital files are not permanent and should need a regular maintenance and transformation to newer formats. For utilizing the full benefits from digitization, organizations should select the material carefully for digitization and digitize only those items that will provide the maximum benefit to both administrator and user. Because, successful digital projects are the outcome of careful evaluation of collections, and also, careful assessment of the institution's goals and priorities and development of thoughtful strategies will assure that meaningful, high-quality digital versions are created, and that both original and digital assets are managed well over time.

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